

13
OBSERVATIONS

ON THE

THICKNESS OF THE HUMAN SKULL.

BY

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THE variation in the thickness of the human skull in different individuals, and in different parts of the same skull, is well known. The causes of these varieties have been assigned to the character of the soft parts, the changing character of the brain, and are, in a great measure, due to the same causes that regulate the growth and development of the individual.

The following observations were in 154 skulls of subjects brought to the anatomical rooms. The measurements were made with callipers carefully adjusted, and in the following regions :—

A. The superior angle of the frontal in the superior longitudinal sinus.

B. Above the external angular process.

C. Parietal eminence.

D. The anterior superior angle of the parietal outside the longitudinal sinus and the Pacchionian depressions.

E. The posterior superior angle of the parietal.

F. Posterior inferior angle of the parietal in the lateral sinus.

G. In the middle fossa, near the centre of the squamous part of the temporal bone.

H. Occipital (superior angle) in the longitudinal sinus.

I. Occipital at the middle of the inferior fossæ.

J. Occipital protuberance.

K. Occipital superior fossæ.

L. Frontal eminence.

M. Weight of brain.

Where two measurements are given, connected by a hyphen, the first indicates the size of the right, the second that of the left.

The numbers indicate sixty-fourths of an inch. Thus, in No. 1, the thickness of the frontal near the superior angle is $\frac{16}{64} = \frac{1}{4}$ inch.

The column immediately succeeding M contains the nature of the convolution markings. These are usually best marked at the base. For the greater number they were slight or absent at the roof.

α. Convolution markings slight.

β. No convolution markings.

γ. Convolution markings distinct over lower parietal part.

In a few cases casts of the interior of the skull were made to determine how far the convolution markings would indicate the position of the fissures. From a study of these it was seen that the convolutions of the temporo-sphenoidal lobe and the lower surface of the frontal were repeated in their cast, but the upper surface of the cast was nearly smooth in many cases.

The mean of the observations in each case is given. It will be seen that although in many cases the thickness on one side exceeds slightly that of the other, yet the mean of one side does not differ materially from that of the other. The thickest skull was that of a female, aged 78, No. 144; but the three succeeding were males. The thinnest skulls in the above list were those of three females. These remarks, however, do not apply to all the measurements. And it must be remembered that the number of female subjects was in excess of the number of the males. A single measurement is not an indication of the general thickness, for in No. 84 the inferior occipital fossæ have a very thin bony wall.

The weight of the brain does not seem to bear any relation to the thickness of the skull. This, however, does not affect the statement that the skull thickens when the brain diminishes.

TABLE.

No.	Sex	Age	A	B	C	D	E	F	G	H	I	J	K	L	M	-
1	M.	—	16	—	19-18	13-11	20-18	—	—	—	—	—	—	—	—	—
2	—	—	18	—	22-23	16-15	10-10	—	—	—	—	—	—	—	—	—
3	—	—	16	—	19.5-20.5	20-16	14-15	—	—	—	—	—	—	—	—	—
4	—	—	11	—	12-12	14-10	13-17	—	—	—	—	—	—	—	—	—
5	—	—	18	—	14-13	15-14	20-16	—	—	26	—	—	—	—	—	—
6	—	—	17	—	9-8	14-15	16-15	—	—	—	—	—	—	—	—	—
7	—	—	11.2	—	16-13	6-11	12-14	—	—	14	—	—	—	—	—	—
8	—	—	17	—	-11.9	12-14	14-15	—	—	19	—	—	—	—	—	—
9	—	—	19	—	17-18	18-17	22.5-20	—	—	26	—	—	—	—	—	—
10	—	—	21	—	18.5-19.5	18-15	22.5-25	—	—	24	—	—	—	—	—	—
11	—	—	13	—	12-4	12 12.3	17-17	—	—	23	—	—	—	—	—	—
12	—	—	14	—	3-4	8-10	9-7	—	—	15	—	—	—	—	—	—
13	—	—	21	—	18-13	18-16	20-17	—	—	25	—	—	—	—	—	—
14	—	—	17.6	—	13-18	16-14	20-20	—	—	30	—	—	—	—	—	—
15	—	—	18	—	13-19	15-16	20-24	—	—	27	—	—	—	—	—	—
16	—	—	22	—	16-17	17-16	16-13	—	—	19	—	—	—	—	—	—
17	—	—	20	—	15-15	17-18	15-13	—	—	20	—	—	—	—	—	—

TABLE—continued.

No.	Sex	Age	A	B	C	D	E	F	G	H	I	J	K	L	M	—
18	M.	56	24	18-16	12-12	16-19	—	14-18	4-3	—	3-4	34	—	—	—	—
19	F.	30	22	-28	-22	22-26	—	12-11	9-14	21	3-1	29	—	—	—	—
20	F.	39	20	20-18	24-20	17-19	—	16-14	5-7	—	11-7	48	—	—	—	—
21	F.	56	16	16-14	16-20	10-7	—	14-12	4-5	—	4-4	28	—	—	—	—
22	F.	56	15	12-10	16-5	10-9	14-16	9-10	5-5.4	15	3-3	27	—	—	—	—
23	F.	60	19	12-11	15-16	14-10	16-16	12-16	4-4	18	7-6	32	—	—	—	—
24	F.	75	20	11-8	18-21	9-14	16-16	12-13	4-3	17	3-4	23	—	—	—	γ
25	M.	30	17	—	17-15	14-15	18-18	14-17	6-5	26	11-8	36	—	—	—	γ
26	—	—	18	—	13-14	15-17	9-13	10-9	—	14	6-8	38	—	—	—	γ
27	F.	60	16	—	8-11	11-12	14-13	10-13	4-3	13	7-6	24	—	—	—	γ
28	—	—	20	6-6	12-10	20-17	12-17	16-14	4-4	—	5-5	34	—	—	—	γ
29	F.	57	16	14-13	12-14	11-10	14-17	10-14	4-5	16	5-5	35	—	—	33	γ
30	M.	52	17	11-10	16-16	16-16	13-14	12-12	6-5	20	8-7	25	—	—	45½	γ
31	M.	70	13	8-10	13-12	12-14	14-13	15-14	7-6	15	4-5½	41	—	—	44	γ
32	F.	64	22	16-13	22-20	19-17	27-29	23-25	5-6	22	6-5	25	—	—	43	γ
33	M.	76	18	12-8	7-8	15-19	18-11	15-	5-2	12	2-3	35	—	—	50	β
34	M.	45	10	15-15	10-12	12-11	13-10	8-8	5-4	13	3-3	32	—	—	52	γ
35	M.	72	18	17-9	15-14	14-15-16	15-14	10-12	4½ 2	14	7-4	41½	—	—	56	γ

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	γ
38	F.	44	20	6-6	18-15	10-12	16-16	17-14	11-11	1-3	16	4 4	28	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	α
39	F.	70	20	23-20	15-14	15-14	20-21	12-13	12-18	4-6	20	7-6	41	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	γ
40	M.	48	13	12 14	13-16	13-16	16-13	17-20	17-16	4-2	22	8-8	40	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	γ
41	M.	68	13	—	10-12	10-12	11-9	11-11	14-18	4-2	15	14-13	37	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	γ
42	F.	30	12	12-16	16-16	10-10	16-14	12-12	12-12	4-3	11	5-3	34	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	β
43	M.	70	16	5-9	18-16	13-12	12-10	8-10	3-1	9	23	8-8	24	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	γ
44	M.	60	17	14-16	22-17	13-17	19-20	19-16	4-3	23	8-8	42	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	γ
45	F.	35	16	9-8	12-12	11-13	13-12	6-9	1-1	14	20	4-6	36	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	γ
46	F.	73	19	16-14	16-18	18-14	17-15	16-16	-2	20	13	7-7	40	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	β
a 47	M.	51	19	16-16	12-16	20-18	14-12	13-16	2½-1	17	17	4-3	32	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	β
48	M.	70	16	8-12	16-18	16-18	14-14	14-14	14-12	6-5	12	8-5	32	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	β
49	M.	50	16	14-12	13-15	12-11	12-12	8-14	3-1	12	12	6-8	32	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	γ
b 50	M.	13	11	8-7	12-14	9-8	15-13	7-8	1-3	14	14	2-2	22	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	γ
51	M.	63	18	16-12	17-15	15-16	18-18	17-20	4-4	21	21	5-6	45	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	β
52	F.	80	15	12-12	16-16	13-12	13-12	13-14	4-5	18	18	3-4	12	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	β
53	F.	35	15	12-10	16-18	16-12	17-16	12-16	4-3	23	23	8-8	36	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	β
54	M.	74	19	10-9	20-20	17-17	13-13	23-20	4-5	19	19	4-5	48	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	α
c 55	M.	80	18	12-25	17-17	14-12	17-14	14-14	4-3	20	20	4-4	40	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	β

^a Lateral sinus not grooved so far as petrous portion of temporal.^b Inner table at parts necrosed.^c Frontal sinuses very large; two inches from side to side; $\frac{3}{4}$ inch deep.

No.	Sex	Age	A	B	C	D	E	F	G	H	I	J	K	L	M	—
56	F.	50	20	12-10	20-19	16-16	16-16	20-17	2-1	18	4-3	25	13-10	17-	53	β
57	M.	13	12	7-8	10-10	10-10	14-14	8-18	8-8	20	8-8	27	19-11	10-8	43	α
58	M.	53	17	14-14	14-14	16-15	17-14	14-11	7-5	23	5-12	33	10-8	17-17	49	β
59	F.	60	17	17-18	21-19	14-14	21-20	11-10	11-9	27	10-12	36	16-16	15-13	42	β
60	M.	54	15	8-11	16-17	9-12	14-15	10-10	2-8	28	5-3.5	27	19-14	10-11	54	α
61	F.	55	12	10-10	14-13	14-13	14-13	11-11	1-1½	17	1-2	27	12-14	15-15	44	β
62	F.	50	15	12-10	14-14	10-12	13-16	11-9	4-4	19	4-4	37	12-24	16-14	43	α
63	M.	57	22	19-20	25-23	16-16	18-18	17-28	12-12	25	14-14	60	18-16	19-24	42	β
64	F.	55	15	12-10	13-12	14-14	16-18	13-16	3-2	23	7-6	46	10-11	12-11	51	β
65	F.	60	14	8-8	22-21	14-13	20-21	11-12	3-4	15	4-4	24	16-18	15-14	39	β
66	F.	61	15	10-9	12-12	13-12	11-13	14-19	5-3	20	4-5	30	12-12	17-16	39	β
67	F.	75	23	12-12	16-19	20-18	17-18	8-8	4-4	24	2-3	33	11-16	13-16	40	γ
68	F.	76	13	13-16	14-15	11-11	14-14	22-19	5-4	15	6-5	31	10-12	17-17	41	α
69	F.	16	10	7-8	10-4	8-9	10-9	8-6	2-3	14	3-4	28	8-8	10-7	42	γ
70	F.	50	14	8-7	13-13	10-8	16-12	11-8	1-11	18	3-2	21	10-8	13-14	43	β
71	F.	61	18	19-13	25-20	15-15	20-21	14-16	3-4	20	6-8	26	15-16	16-16	44	β
72	F.	46	16	9-9	13-13	14½-13½	16-17	10-13	2-3	20	8-9	46	11-12	16-16	45	γ
73	F.	45	17	5-11	16-19	19-18	18-19	14-16	4-4	20	6-4	37	10-9	20-19	46	γ

TABLE—continued.

No.	Sex	Age	A	B	C	D	E	F	G	H	I	J	K	L	M	—
95	F.	55	12	13-16	9-11	14-10	19-19	15-13	2-2	17	4-3	28	9-10	16-14	—	γ
96	M.	75	12	12-8	8-8	12-12	10-10	8-12	1-½	16	4-3	31	4-6	8-9	—	γ
97	F.	40	20	10-11	14-16	13-13	17-17	11-10	1-2	20	5-4	34	24-16	16-17	—	α
98	M.	45	20	14-14	16-16	14-13	14-13	9-8	2-3	18	10-10	32	6-10	16-17	—	β
99	M.	60	17	24-25	22-21	18-16	18-20	14-15	4-5	28	3-2	45	9-10	32-31	—	β
100	M.	45	18	12-12	17-17	15-16	14-14	11-11	4-4	22	1-2	38	10-9	17-16	—	α
101	M.	30	22	11-11	16-16	15-13	14-14	4-6	2-2	21	3-3	29	4-5	14-14	—	α
102	F.	48	18	10-8	19-20	14-13	16-17	9-13	3-4	24	4-3	40	12-10	15-18	—	β
103	M.	60	24	10-12	19-18	28-24	20-24	17-19	3-2	28	3-6	46	16-16	20-20	—	α
104	M.	50	21	12-10	8-10	14-20	10-9	10-6	2-2	13	4-3	34	5-6	9-9	—	γ
105	M.	61	12	12-12	12-13	11-12	11-12	12-12	2-2	16	3-3	48	8-9	12-14	—	β
106	F.	61	14	16-17	22-21	18-20	16-13	12-11	4-4	24	3-3	36	8-6	24-22	—	α
107	F.	61	23	16-17	18-20	18-16	25-21	12-13	4-8	32	4-2	45	24-24	20-22	—	α
108	F.	50	18	12-10	16-18	16-12	13-13	12-12	3-4	32	3½-4	40	16-15	14-18	—	β
109	F.	50	15	12-12	12-13	9-8	11-12	12-14	6-6	23	4-4	36	9-8	16-18	—	α
110	M.	48	22	22-24	17-20	22-18	15-14	12-12	3-4	16	12-13	52	15-15	16-16	—	α
111	F.	40	22	16-15	20-10	15-17	15-15	13-14	3-2	15	4-3	40	14-12	18-17	—	α
112	F.	60	20	17-18	18-20	19-19	18-18	7-12	2-3	23	3-3	40	14-12	18-20	—	β

111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131
				F.	F.	F.	F.	F.	F.	M.	F	F.	F.	M.	M.	F.	F.	M.	M.	F.
40	40	40	40	46	49	40	48	20	16	72	20	50	54	40	70	68	70	65	69	60
24	24	24	24	16	16	9	20	16	6	13	18	18	18	20	17	21	18	17	24	14
16-15	16-15	16-15	16-15	12-14	12-10	9-7	11-11	13-12	11-11	15-17	14-13	8-8	15-20	16-14	13-13	15-14	9-10	12-12	17-18	9-9
20-10	20-10	20-10	20-10	18-13	15-15	16-16	16-14	15-13	18-13	14-14	16-20	14-16	16-20	14-16	10-14	18-17	13-16	13-15	25-26	10-12
19-10	19-10	19-10	19-10	12-12	13-12	9-9	15-13	15-15	12-12	14-13	16-15	16-15	16-15	20-15	16-11	16-15	13-12	13-12	19-16	14-14
16-13	16-13	16-13	16-13	16-13	16-16	11-10	14-15	15-15	12-12	14-13	14-12	14-15	18-16	17-16	15-15	19-21	15-13	16-17	24-24	12-12
7-12	7-12	7-12	7-12	16-14	11-14	13-8	14-10	8-13	8-8	16-16	6-7	9-11	9-16	12-13	19-19	12-12	10-11	18-16	19-22	9-10
2-2	2-2	2-1	2-1	2-2	4-4	2-1	2-1	2-2	1 $\frac{1}{2}$ -1	2-2	$\frac{1}{2}$ -2	1-1	1-1	2-4	4-3	3-3	2-2	3-4	2-4	5-6
17	17	17	18	20	22	17	18	17	16	17	21	21	21	18	17	28	18	25	32	16
4-3	4-3	4-3	2-1	2-4	4-5	5-4	2-1	—	—	—	—	—	—	—	—	—	—	—	—	—
30	30	30	28	32	29	28	28	40	34	42	31	32	36	48	48	36	39	41	55	32
1-12	1-12	1-12	11-11	9-8	12-11	9-8	11-11	9-8	6-5	4-6	9-8	7-8	11-10	10-11	11-13	12-15	8-8	12-12	15-14	12-11
13-17	13-17	13-17	10-10	13-13	16-15	15-15	10-10	14-12	16-18	16-17	11-12	11-12	24-25	12-13	11-13	16-17	10-12	16-18	21-23	16-17
a	a	a	β	a	a	a	a	a	a	γ	β	a	a	a	a	a	β	a	β	β

^a Frontal sinuses extend high up into bone.^b A large depression at internal occipital protuberance, with foramen in the centre.^c The outer occipital protuberance higher up than the inner.^d Six Wormean bones in upper left, 7 in upper right suture; superior longitudinal sinus continuous with right lateral large frontal sinus.

TABLE—continued.

No.	Sex	Age	A	B	C	D	E	F	G	H	I	J	K	L	M	—
132	M.	40	22	14-15	8-12	14-14	18-16	16-17	6-6	27	4-2	52	13-9	12-18	—	γ
^a 133	M.	40	15	15-15	16-18	12-13	15-15	11-12	4-5	20	4-4	38	5-9	14-21	—	β
134	F.	30	12	12-10	12-16	9-10	16-14	4-4	1-1	16	3-3	34	12-10	15-17	—	α
135	M.	28	16	20-18	16-15	15-14	18-16	13-17	4-4	20	2-2	32	11-12	15-16	—	α
^b 136	F.	32	12	17-18	12-14	11-12	14-14	12-9	1-1	18	4-4	28	9-8	12-13	—	α
137	F.	45	20	14-9	14-16	13-13	16-15	14-14	2-	22	4-4	31	8-8	19-16	—	α
138	M.	42	16	16-12	6-8	12-10	8-17	9-12	2-1	16	4-2	28	6-4	11-12	—	α
139	M.	65	15	10-10	10-10	14-14	13-14	14-11	2-1	19	2-2	37	12-10	12-13	—	α
^c 140	F.	40	20	15-12	12-14	20-20	13-12	9-11	2-3	17	4-4	36	8-10	10-12	—	γ
^d 141	M.	75	18	10-12	12-14	20-18	16-15	11-13	1-2	20	2-2	28	8-9	13-11	—	α
142	F.	78	15	10-10	12-12	20-16	15-15	16-8	1-1	21	1-1½	40	10-10	14-12	—	α
143	F.	75	16	9-12	12-12	10-12	11-10	6-9	2-2	18	3-1	30	9-7	15-14	—	α
144	F.	78	26	21-20	26-28	21-23	24-28	18-14	4-4	28	4-4	40	16-16	24-27	—	α
145	M.	60	16	16-17	12-11	12-11	14-15	14-14	4-4	24	6-6	50	11-10	13-15	—	α
^e 146	M.	70	15	18-19	12-12	16-13	13-15	10-6	2-3	24	1-1	22	7-12	19-15	--	α
^f 147	M.	40	20	4-8	11-11	12-13	12-12	13-16	1-4	20	3-2	34	8-8	13-13	—	γ
148	M.	74	20	10-11	12-17	14-14	12-14	18-18	3-2	19	4-2	44	10-9	11-11	—	α

SUMMARY.

Age	A	B	C	D	E	F	G	H	I	J	K	L	M
	2598.8	1642-1675	2224-2307.9	2218-2126.8	2298.5-2283	1664-1772	437-431.9	2883	567-550.5	4102	1115-1098	1529-1568	2172
	154	131-132	153-154	154	150	137-135	136-134	143	124-123	137	105	103	48
53.5	16.87	12.5-12.7	14.5-14.3	14.4-13.7	15.2-15.2	11.4-13.1	3.2-3.16	20.1	4.57-4.4	23.3	16.6-10.4	14.8-15.2	45.2

The first column represents the mean of the ages—*i.e.*, 53.5.

The first line represents the sum of the measurements.

The third line represents the mean of the measurements.

^a Outer occipital protuberance higher than the inner.

^b Large frontal sinuses.

^c The inferior longitudinal sinus passes to right lateral.

^d The outer occipital protuberance higher than the inner.

^e The outer occipital protuberance much higher than the inner.

^f A well-marked ridge sinus across the inferior fossa of the occipital bone.

